

Exercises 1–8 show that B is the inverse of A .

$$1. A = \begin{bmatrix} 2 & 1 \\ 5 & 3 \end{bmatrix}, B = \begin{bmatrix} 3 & -1 \\ -5 & 2 \end{bmatrix}$$

$$2. A = \begin{bmatrix} 1 & -1 \\ -1 & 2 \end{bmatrix}, B = \begin{bmatrix} 2 & 1 \\ 1 & 1 \end{bmatrix}$$

$$3. A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}, B = \begin{bmatrix} -2 & 1 \\ 3 & -1 \end{bmatrix}$$

$$4. A = \begin{bmatrix} 1 & -1 \\ 2 & 3 \end{bmatrix}, B = \begin{bmatrix} 3 & 1 \\ -5 & 5 \end{bmatrix}$$

$$5. A = \begin{bmatrix} -2 & 2 & 3 \\ 1 & -1 & 0 \\ 0 & 1 & 4 \end{bmatrix}, B = \frac{1}{3} \begin{bmatrix} -4 & -5 & 3 \\ -4 & -8 & 3 \\ 1 & 2 & 0 \end{bmatrix}$$

$$6. A = \begin{bmatrix} 2 & -17 & 11 \\ -1 & 11 & -7 \\ 0 & 3 & -2 \end{bmatrix}, B = \begin{bmatrix} 1 & 1 & 2 \\ 2 & 4 & -3 \\ 3 & 6 & -5 \end{bmatrix}$$

$$7. A = \begin{bmatrix} 2 & 0 & 1 & 1 \\ 3 & 0 & 0 & 1 \\ -1 & 1 & -2 & 1 \\ 4 & -1 & 1 & 0 \end{bmatrix},$$

$$B = \begin{bmatrix} -1 & 2 & -1 & -1 \\ -4 & 9 & -5 & -6 \\ 0 & 1 & -1 & -1 \\ 3 & -5 & 3 & 3 \end{bmatrix}$$

$$8. A = \begin{bmatrix} -1 & 1 & 0 & -1 \\ 1 & -1 & 1 & 0 \\ -1 & 1 & 2 & 0 \\ 0 & -1 & 1 & 1 \end{bmatrix},$$

$$B = \frac{1}{3} \begin{bmatrix} -3 & 1 & 1 & -3 \\ -3 & -1 & 2 & -3 \\ 0 & 1 & 1 & 0 \\ -3 & -2 & 1 & 0 \end{bmatrix}$$

Exercises 9–24 find the inverse of the matrix (if it exists).

$$9. \begin{bmatrix} 2 & 0 \\ 0 & 3 \end{bmatrix}$$

$$10. \begin{bmatrix} 1 & 2 \\ 3 & 7 \end{bmatrix}$$

$$11. \begin{bmatrix} 1 & -2 \\ 2 & -3 \end{bmatrix}$$

$$13. \begin{bmatrix} -1 & 1 \\ -2 & 1 \end{bmatrix}$$

$$15. \begin{bmatrix} 2 & 4 \\ 4 & 8 \end{bmatrix}$$

$$17. \begin{bmatrix} 2 & 7 & 1 \\ -3 & -9 & 2 \end{bmatrix}$$

$$19. \begin{bmatrix} 1 & 1 & 1 \\ 3 & 5 & 4 \\ 3 & 6 & 5 \end{bmatrix}$$

$$21. \begin{bmatrix} 1 & 0 & 0 \\ 3 & 4 & 0 \\ 2 & 5 & 5 \end{bmatrix}$$

$$23. \begin{bmatrix} -8 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 4 & 0 \\ 0 & 0 & 0 & -5 \end{bmatrix}$$

$$24. \begin{bmatrix} 1 & 3 & -2 & 0 \\ 0 & 2 & 4 & 6 \\ 0 & 0 & -2 & 1 \\ 0 & 0 & 0 & 5 \end{bmatrix}$$

$$12. \begin{bmatrix} -7 & 33 \\ 4 & -19 \end{bmatrix}$$

$$14. \begin{bmatrix} 11 & 1 \\ -1 & 0 \end{bmatrix}$$

$$16. \begin{bmatrix} 2 & 3 \\ 1 & 4 \end{bmatrix}$$

$$18. \begin{bmatrix} -2 & 5 \\ 6 & -15 \\ 0 & 1 \end{bmatrix}$$

$$20. \begin{bmatrix} 1 & 2 & 2 \\ 3 & 7 & 9 \\ -1 & -4 & -7 \end{bmatrix}$$

$$22. \begin{bmatrix} 1 & 0 & 0 \\ 3 & 0 & 0 \\ 2 & 5 & 5 \end{bmatrix}$$

In Exercises 25–30, use the matrix capabilities of a calculator to find the inverse of the matrix (if it exists).

$$25. \begin{bmatrix} 1 & 2 & -1 \\ 3 & 7 & -10 \\ -5 & -7 & -15 \end{bmatrix}$$

$$27. \begin{bmatrix} 1 & 1 & 2 \\ 3 & 1 & 0 \\ -2 & 0 & 3 \end{bmatrix}$$

$$29. \begin{bmatrix} 0.1 & 0.2 & 0.3 \\ -0.3 & 0.2 & 0.2 \\ 0.5 & 0.4 & 0.4 \end{bmatrix}$$

$$26. \begin{bmatrix} 10 & 5 & -7 \\ -5 & 1 & 4 \\ 3 & 2 & -2 \end{bmatrix}$$

$$28. \begin{bmatrix} 3 & 2 & 2 \\ 2 & 2 & 2 \\ -4 & 4 & 3 \end{bmatrix}$$

$$30. \begin{bmatrix} 2 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 5 \end{bmatrix}$$

$$31. \begin{bmatrix} 1 & 0 & 3 & 0 \\ 0 & 2 & 0 & 4 \\ 1 & 0 & 3 & 0 \\ 0 & 2 & 0 & 4 \end{bmatrix}$$

$$32. \begin{bmatrix} -1 & 0 & 1 & 0 \\ 0 & 2 & 0 & -1 \\ 2 & 0 & -1 & 0 \\ 0 & -1 & 0 & 1 \end{bmatrix}$$

$$33. \begin{bmatrix} 1 & -2 & -1 & -2 \\ 3 & -5 & -2 & -3 \\ 2 & -5 & -2 & -5 \\ -1 & 4 & 4 & 11 \end{bmatrix}$$

$$34. \begin{bmatrix} 4 & 8 & -7 & 14 \\ 2 & 5 & -4 & 6 \\ 0 & 2 & 1 & -7 \\ 3 & 6 & -5 & 10 \end{bmatrix}$$

35. If A is a 2×2 matrix given by

$$A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$$

then A is invertible if and only if $ad - bc \neq 0$. If $ad - bc \neq 0$, verify that the inverse is given by

$$A^{-1} = \frac{1}{ad - bc} \begin{bmatrix} d & -b \\ -c & a \end{bmatrix}.$$

36. Use the result of Exercise 35 to find the inverse of each matrix.

$$(a) \begin{bmatrix} 5 & -2 \\ 2 & 3 \end{bmatrix}$$

$$(b) \begin{bmatrix} 7 & 12 \\ -8 & -5 \end{bmatrix}$$

In Exercises 37–40, use an inverse matrix to solve the system of linear equations. (Use the inverse matrix found in Exercise 11.)

$$37. \begin{cases} x - 2y = 5 \\ 2x - 3y = 10 \end{cases}$$

$$39. \begin{cases} x - 2y = 4 \\ 2x - 3y = 2 \end{cases}$$

$$38. \begin{cases} x - 2y = 0 \\ 2x - 3y = 3 \end{cases}$$

$$40. \begin{cases} x - 2y = 1 \\ 2x - 3y = -2 \end{cases}$$

In Exercises 41–44, use the inverse matrix and the matrix capabilities of a TI-84 calculator to solve the system of linear equations. (Use the inverse matrix found in Exercise 11.)

$$41. \begin{cases} x + y + z = 0 \\ 3x + 5y + 4z = 5 \\ 3x + 6y + 5z = 2 \end{cases} \quad 42. \begin{cases} x + y + z = -1 \\ 3x + 5y + 4z = 2 \\ 3x + 6y + 5z = 0 \end{cases}$$

In Exercises 43 and 44, use the inverse matrix and the matrix capabilities of a TI-84 calculator to solve the system of linear equations. (Use the inverse matrix found in Exercise 11.)

$$43. \begin{cases} x_1 - 2x_2 - x_3 - 2x_4 = 0 \\ 3x_1 - 5x_2 - 2x_3 - 3x_4 = 1 \\ 2x_1 - 5x_2 - 2x_3 - 5x_4 = -1 \\ -x_1 + 4x_2 + 4x_3 + 11x_4 = 2 \end{cases}$$

$$44. \begin{cases} x_1 - 2x_2 - x_3 - 2x_4 = 1 \\ 3x_1 - 5x_2 - 2x_3 - 3x_4 = -2 \\ 2x_1 - 5x_2 - 2x_3 - 5x_4 = 0 \\ -x_1 + 4x_2 + 4x_3 + 11x_4 = -3 \end{cases}$$

In Exercises 45–52, use the inverse matrix and the matrix capabilities of a TI-84 calculator to solve the system of linear equations. (Use the inverse matrix found in Exercise 11.)

$$45. \begin{cases} 3x + 4y = -2 \\ 5x + 3y = 4 \end{cases}$$

$$46. \begin{cases} 18x + 12y = 13 \\ 30x + 24y = 23 \end{cases}$$

$$47. \begin{cases} -0.4x + 0.8y = 1.6 \\ 2x - 4y = 5 \end{cases}$$

$$48. \begin{cases} 13x - 6y = 17 \\ 26x - 12y = 8 \end{cases}$$

$$49. \begin{cases} 3x + 6y = 6 \\ 6x + 14y = 11 \end{cases}$$

$$50. \begin{cases} 3x + 2y = 1 \\ 2x + 10y = 6 \end{cases}$$

$$51. \begin{cases} 4x - y + z = -5 \\ 2x + 2y + 3z = 10 \\ 5x - 2y + 6z = 1 \end{cases}$$

$$52. \begin{cases} 4x - 2y + 3z = -2 \\ 2x + 2y + 5z = 16 \\ 8x - 5y - 2z = 4 \end{cases}$$